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ABSTRACT

Many companies using Statistical Process Control (SPC) in their manufacturing processes have found that, despite the training difficulties presented by the technique, the rewards of successful SPC include increased productivity, quality, and market leadership. The Ford Motor Company has developed its SPC training with interactive video, which provides a variety of message systems via a single medium, including moving pictures, static pictures, text, diagrams, and sound, all with the opportunity for interaction. Experiments with interactive video training in the United States and the United Kingdom have confirmed its effectiveness and that trainees enjoy using it. Ford commissioned the development of an interactive video course on SPC and recommended its use to its supplier companies for training its personnel, from middle management to shop floor operators. In this video, live drama with question and answer sequences is complemented with graphic animation and interactive simulations. Ford commissioned the Council for Educational Skills Training to investigate the effectiveness of and user response to the first two disks. Most of the participants' responses to a questionnaire and follow-up interview indicated strong positive feelings about the program, and comparison of pre- and posttest results indicated a significant learning gain in most cases. The volume of sales of the SPC course to both Ford suppliers and non-suppliers provides further evidence of the success of the course. The results demonstrate the potential of interactive video for improving training for applications as complex as SPC. (16 references) (GL)

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Peter Copeland - Futuremedia Ltd.

INTERACTIVE VIDEO: MEETING THE FORD CHALLENGE

One of the largest investments in interactive video as a training medium in Europe to date is a five-disc series produced for the Ford Motor Company by Futuremedia on the application of Statistical Process Control (SPC) to achieve quality in manufacturing and service industries alike.

SPC, whereby statistical techniques are used to examine a process so that quality can be built-in - rather than the more traditional approach to quality control which is to inspect-out defects - is a difficult concept to grasp and implement. It presents training problems at both the shopfloor and line management levels.

But as many companies who have ventured into using it have found, the reward for successful SPC training is large: increased productivity, quality and market leadership in the face of increasing international competition.

Ford, already an established user of SPC, has chosen to develop its SPC training further with interactive video.

In this presentation, Dr. Peter Copeland, Managing Director of Futuremedia, the production company involved with Ford's Education and Training Department in the development of the SPC course, examines the value of interactive video and shows examples of its use from the award winning SPC course.

Interactive video - the marriage of the computer with video is a remarkable medium that is now rapidly being acknowledged for its capability to teach, motivate, and achieve excellent levels of success. Additionally it compresses the time to learn and in situations where the training requirement is large and dispersed, it achieves considerable savings in cost. Experiments with interactive video used for training in the US and UK have confirmed its effectiveness and that trainees enjoy using it.

In a nine-videodisc project for Florida State Department of Health and Rehabilitation, the results showed a 25 per cent reduction in training time compared with the conventional training used previously. Students scored an average of 83 per cent (70 per cent was judged successful) and all students said they preferred IV to other forms of learning. The average study time for the course was 120 hours, although the range of study time was between 60 and 194 hours.

In a benchmark study conducted by DEC, interactive video was used to teach field service engineers. The results showed the course took less time (from 23.1 per cent to 46.5 per cent less time) than that used previously and that students had a high opinion of the course and perceived it was more stimulating and motivating than previous courses (DEC 1983).

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In two independent studies by Schaffer and Hannafin (1986) and Copeland (1986), which examined the effects of increasing interactivity, both reported an increase in learning gain that was directly attributable to an increase in interactivity.

In recent studies in the UK, British Telecom has indicated an order of magnitude reduction in training costs (from £150 to £15 per head); Jaguar has reduced training time by 50 per cent; and IBM achieved a 300 per cent increase in the number of new managers achieving mastery (NIVC 1987).

These extremely encouraging results beg the question why is interactive video different and better than media that have previously been used for training?

One theory that is receiving considerable attention promotes the view that different media provide different message systems (or channels) via which information can be communicated. And that different message systems have very different characteristics that can accommodate certain communications tasks better than others (Salomon 1979).

For instance, teaching someone mathematics via a sound only system contrasts greatly with, say, using television, perhaps because visual symbolic modelling is an intrinsic requirement of mathematics.

Similar differences can be shown between say, teaching car mechanics via a maintenance manual and using video. Copeland (1987) presented a model that attempted to capture the distinctive capabilities of different message systems and those groups of message systems that individually constitute a given medium.

Significant to this was the multitude of message systems facilitated by interactive video. From moving pictures, static pictures, to text, diagrams, and sound - all with the opportunity for interaction - interactive video was presented as the omnibus medium potentially offering, via a single medium, more message systems than ever before.

But because interactive video provides such a variety of message systems, it does not mean that they will necessarily be used. This leads us to the obvious conclusion that one interactive video programme can be very different from another. In judging the benefits of interactive video, therefore, we are judging on the basis of a given programme, or a collection of programmes.

In doing this, it is important to note that the medium of interactive video will not provide learning and communication benefits per se. The skills and experience of the programme designers, producers and programmers are critical to the creation of good and successful interactive video programmes. Because interactive video is a relatively new medium, these skills are in relatively short supply.

The subject of SPC is a particularly demanding training requirement. But not only has interactive video the capability to achieve such difficult training, its application in this particular instance has potential to make

a direct contribution to improving a company's performance. Ford acknowledged this by commissioning the development of the course and recommending its use to their vast number of supplier companies - a potential user audience in excess of 100,000.

The audience for which the course is intended varies from middle management to shop floor operators. Not only do they have to understand and value the concept they have to be able to implement it and perform the skills it demands.

In the SPC Interactive Video all of these factors have been addressed - live drama with question and answer sequences is complemented with video graphic animation and interactive simulations.

Over six hundred learning objectives were established. Within these, no assumption was made that the end user had the prior skills or knowledge necessary for SPC nor even that he or she could use a computer keyboard.

The use of the trackerball allows the user to plot points and chart. The keyboard allows multiple choice, and free-format input and simulated process control. Over and above the interactive programme the user is able to access a whole range of features such as a glossary, enquiry desk, screen calculator and so on. All these have been designed to exploit the features of interactive video technology, using high quality fonts, good picture resolution and fast computer software.

Disc One explains how the system works for those who haven't used it before and then proceeds to introduce the user to a fictitious company in trouble. They're in danger of losing business to a competitor because of poor quality.

We'll pick the programme up at the point where the interactive tasks are described and the company is introduced:

DEMO OF VIDEODISCS. TO SHOW LEARNING POINTS AROUND ATTITUDES AND THE SPC CONCEPT ITSELF. MOVE TO DISC TWO TO SHOW SIMULATIONS.

The SPC course is adaptive to the responses and choices made by the individual user. A 'user profile' for instance, is established by storing answers to questions and choice of routeways. The presentation is then able to invoke different narrative, different text or branch to another part of the videodisc in order to respond giving what then appears to be personalised comment and advice.

In order to provide the user with the feeling of achievement and progress, use is made of a gaming element which comprises a roadmap. The road can eventually lead to success depending on the number of questions answered correctly. Forfeit questions, hints and clues ensure every user can succeed sooner or later!

Jumping from one area of the videodisc to another is achieved without the user being aware by employing a technique known as 'instant jump'. Essentially this allows the videodisc read head to search across the disc whilst at the same time maintaining the existing picture. The result is a seamless transition of images and sound that is presented in response to an individual's responses and study strategy.

As the course proceeds realistic process simulations allow the user to 'operate' process control in order to gather and manipulate data, plot it on charts and analyse the results.

A programme on the subject of quality needs to reflect quality in both its operation and visual appearance. High quality graphics and computer video animation ensure that the standard of presentation is high. Where text is presented this is achieved by using thousands of video still-frames produced by using high quality video fonts rather than computer generated text. The penalty is that the screens have to be accurate and revision infrequent. The benefits are fast, high-quality displays with very little storage overhead.

No real judgement of the efficiency of interactive video can be had unless evidence is collected from its field of use. Ford commissioned the Council for Educational Skills Training to investigate the effectiveness of and user-response to the first two discs. The studies reported were conducted over four locations and involved fifty-four users of varied age and educational background.

They involved an interview based on a questionnaire, a pre-test, programme utilisation, post-test and final interview.

First, time taken to complete each of the two discs averaged 59 and 51 minutes respectively, although the maximum time for some users extended to 1 hour 55 minutes. Gain scores seemed not to have been influenced by the user's prior experience with computers.

The comparison of pre-test and post-test scores for all users showed that most improved their score considerably. The report indicated, "It is extremely unusual to obtain a distribution of this type within an educational or training context and that SPC Disc One produced a highly significant comparison between pre-test and post-test scores."

Finally, most of the participants' responses indicated that they had strong positive feelings towards the programme. These echo the results of research by Copeland (1986) cited earlier where all students reported they enjoyed learning from interactive video.

Further evidence of success is provided by the number of courses being sold. LaserMedia UK is responsible for marketing the course and they report that in 90 per cent of instances where companies hire the course for one week, they actually then buy it. The volume of sales both to Ford supplier companies and non-Ford suppliers endorses the success of the SPC course itself and a very positive response to interactive video training.

These results show that interactive video can make a significant contribution to accelerating the training provision, and to increasing its impact and benefits to large and small companies alike. The groundswell of opinion is growing in its favour. The current impetus to produce more, good interactive video will enable its benefits to become more widespread.

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